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THE FEBRUARY MEETING IN NEW YORK

The three hundred thirty-ninth meeting of the American Mathematical Society was held at Columbia University on Saturday, February 20, 1937. The attendance included the following one hundred eight members of the Society:

R. P. Agnew, V. A. Ames, R. L. Anderson, Reinhold Baer, R. P. Bailey, M. F. Becker, Gertrude Blanch, H. F. Bohnenblust, Samuel Borofsky, C. B. Boyer, H. W. Brinkmann, A. B. Brown, J. H. Bushey, J. Hughes Bushey, J. A. Clarkson, George Comenetz, M. D. Darkow, Norman Davidowitz, Arnold Dresden, Melvin Dresher, W. L. Duren, H. F. Fehr, Aaron Fialkow, R. M. Foster, T. C. Fry, A. S. Gale, B. P. Gill, J. W. Givens, C. C. Grove, Margaret Gurney, Israel Halperin, Alan Hazeltine, L. S. Hill, Einar Hille, Lulu Hofmann, T. R. Hollcroft, I. M. Hostetter, Harold Hotelling, E. M. Hull, Witold Hurewicz, R. A. Johnson, I. N. Kagno, Edward Kasner, J. R. Kline, Solomon Lefschetz, D. H. Lehmer, Madeline Levin, L. A. Lorch, A. N. Lowan, J. C. C. McKinsey, L. A. MacColl, H. M. MacNeille, H. F. MacNeish, W. T. Martin, Walther Mayer, A. E. Meder, J. A. Mira, E. C. Molina, Deane Montgomery, C. A. Nelson, C. O. Oakley, Alta Odoms, Oystein Ore, A. E. Pitcher, E. L. Post, Walter Prenowitz, R. G. Putnam, H. A. Rademacher, J. F. Randolph, M. S. Rees, C. F. Rehberg, F. G. Reynolds, Moses Richardson, R. G. D. Richardson, J. F. Ritt, M. S. Robertson, S. L. Robinson, B. M. Rubin, O. F. G. Schilling, I. J. Schoenberg, Max Shiffman, C. G. Shover, L. P. Siceloff, Olive Sinclair, James Singer, Abraham Sinkov, P. A. Smith, W. M. Smith, R. C. Stauffer, N. E. Steenrod, W. C. Strodt, M. M. Sullivan, J. M. Thomas, T. Y. Thomas, A. W. Tucker, I. L. Van Dyck, Oswald Veblen, W. A. Vezeau, Louis Weisner, M. J. Weiss, A. L. Whiteman, Norbert Wiener, A. H. Wilson, H. P. Wirth, H. N. Wright, Oscar Zariski, Leo Zippin, H. S. Zuckerman.

The meeting opened on Saturday morning with a session for short papers. In the afternoon there was a general session at which Professor T. R. Hollcroft gave an address on *The existence of algebraic plane curves with given singularities.*

Titles and cross references to the abstracts of the papers read at this meeting follow below; papers whose abstract numbers are followed by the letter *t* were read by title. Papers numbered 1 to 10 were read at the morning session, Professor J. F. Ritt presiding. Professor Norbert Wiener presided at the afternoon session. Mr. Whiteman was introduced by Professor Leonard Carlitz.

1. *Almost periodic transformation groups*, by Professor Deane Montgomery. (Abstract 43-3-102.)

2. *On a generalized theorem of higher reciprocity*, by Mr. A. L. Whiteman. (Abstract 43-3-108.)

3. *Systems of algebraic partial difference equations*, by Mr. W. C. Strodt. (Abstract 43-3-107.)

4. *Comparisons of products of methods of summability*, by Professor R. P. Agnew. (Abstract 43-3-96.)

5. *A convergent series for the partition function* $p(n)$, by Professor H. A. Rademacher. (Abstract 43-1-91.)

6. *On the Hardy-Ramanujan series for the partition function*, by Dr. D. H. Lehmer. (Abstract 43-3-101.)

7. *A note on the convergence of linear operations*, by Dr. R. P. Bailey. (Abstract 43-3-97.)

8. *On certain metric spaces arising from euclidean spaces by a change of metric and their imbedding in Hilbert space*, by Dr. I. J. Schoenberg. (Abstract 43-3-105.)

9. *Systems of plane curves*, by Dr. Aaron Fialkow (National Research Fellow). (Abstract 43-1-90.)

10. *On generating the simple group* $LF(2, 2^N)$ *by two operators of periods two and three* (preliminary report), by Dr. Abraham Sinkov. (Abstract 43-3-106.)

11. *On lattices of hyperplanes*. I, by Mr. Garrett Birkhoff. (Abstract 43-3-98-*t*.)

12. *Internal and external means arising from the scaling of frequency functions*, by Professor E. L. Dodd. (Abstract 43-1-88-*t*.)

13. *A note on groups of order* 24, by Dr. D. M. Dribin (National Research Fellow). (Abstract 43-3-99-*t*.)

14. *Plane cubic curves invariant under quadratic transformations*, by Dr. J. M. Feld. (Abstract 43-1-89-*t*.)

15. *The schools of thought in modern mathematics*, by Mr. E. H. Larguier. (Abstract 43-3-100-*t*.)

16. *Critical points of a pair of functions* (preliminary report), by Dr. A. E. Pitcher. (Abstract 43-3-103-*t*.)

17. *Multivalent functions of order p*, by Dr. M. S. Robertson. (Abstract 43-3-104-*t*.)

18. *A theory of oriented angles in the foundations of geometry*, by Dr. A. R. Schweitzer. (Abstract 43-1-92-*t*.)

R. G. D. RICHARDSON,
Secretary

THE MARCH MEETING IN NEW YORK

The three hundred fortieth meeting of the American Mathematical Society was held at Columbia University on Friday and Saturday, March 26–27, 1937. The attendance included the following two hundred forty-seven members of the Society:

C. R. Adams, H. S. Adams, R. B. Adams, E. S. Akeley, E. B. Allen, V. A. Ames, R. C. Archibald, R. G. Archibald, Reinhold Baer, M. F. Becker, D. L. Bernstein, Felix Bernstein, A. C. Berry, Garrett Birkhoff, G. D. Birkhoff, A. H. Black, Gertrude Blanch, R. P. Boas, Salomon Bochner, H. F. Bohnenblust, Samuel Borofsky, C. B. Boyer, A. D. Bradley, H. W. Brinkmann, A. B. Brown, A. W. Bull, F. W. Burton, Herbert Busemann, J. H. Bushey, J. Hughes Bushey, S. S. Cairns, J. W. Calkin, A. D. Campbell, W. B. Campbell, P. A. Caris, Alonzo Church, A. H. Clifford, L. W. Cohen, George Comenetz, J. L. Coolidge, L. P. Copeland, Richard Courant, H. B. Curry, D. R. Curtiss, M. D. Darkow, Norman Davidowitz, J. J. De Cicco, Vincent Dillon, J. L. Doob, Arnold Dresden, Melvin Dresher, D. M. Dribin, Nelson Dunford, W. L. Duren, J. E. Eaton, L. P. Eisenhart, H. T. Engstrom, Aaron Fialkow, T. S. Fiske, W. B. Fite, W. W. Flexner, M. M. Flood, Tomlinson Fort, R. M. Foster, J. S. Frame, C. W. Franklin, Bernard Friedman, Kurt Friedrichs, Orrin Frink, T. C. Fry, B. P. Gill, R. L. Gilman, M. A. Girshick, J. W. Givens, Jr., W. O. Gordon, S. H. Gould, A. A. Grant, A. M. C. Grant, M. C. Graustein, W. C. Graustein, M. B. Greenebaum, J. A. Greenwood, L. W. Griffiths, C. C. Grove, F. C. Hall, Marshall Hall, Israel Halperin, Philip Hartman, B. A. Hausmann, E. K. Haviland, G. A. Hedlund, E. H. C. Hildebrandt, Einar Hille, Banesh Hoffman, Lulu Hofmann, T. R. Hollcroft, I. M. Hostetter, Harold Hotelling, S. E. Hotelling, E. M. Hull, Witold Hurewicz, M. H. Ingraham, Nathan Jacobsen, S. A. Joffe, R. A. Johnson, F. E. Johnston, M. L. Kales, E. R. van Kampen, Edward Kasner, L. S. Kennison, R. B. Kershner, P. W. Ketchum, Tsai-Hau Kiang, J. R. Kline, Morris Kline, M. S. Knebelman, A. W. Landers, M. K. Landers, A. E. Landry, Solomon Lefschetz, D. H. Lehmer, A. M. M. Lehr, Madeline Levin, S. B. Littauer, Marie Litzinger, L. A. Lorch, A. N. Lowan, L. L. Lowenstein, R. R. Lyle, N. H. McCoy, J. C. C. McKinsey, L. A. MacColl, Saunders MacLane, H. M. MacNeille, H. F. MacNeish, W. G. Madow, Karl Menger, A. N. Milgram, H. H. Mitchell, E. C. Molina, Deane Montgomery, Richard Morris, D. S. Morse, H. M. Morse, F. D. Murnaghan, F. J. Murray, D. S. Nathan, C. A. Nelson, John von Neumann, C. O. Oakley, Alta Odoms, Rufus Oldenburger, E. J. Olson, Oystein Ore, E. R. Ott, F. W. Owens, H. B. Owens, J. C. Oxtoby, C. K. Payne, W. F. Penney, B. J. Pettis, C. S. Pettis, H. B. Phillips, E. L. Post, Walter Prenowitz, G. B. Price, R. G. Putnam, H. A. Rademacher, S. M. Rambo, J. F. Randolph, H. W. Raudenbush, Robert Rawhouser, C. J. Rees, M. S. Rees, Moses Richardson, R. G. D. Richardson, John Riordan, J. F. Ritt, H. P. Robertson, M. S. Robertson, S. L. Robinson, J. B. Rosser, S. G. Roth, N. N. Royall, O. F. G. Schilling, I. J. Schoenberg, G. E. Schweigert, Wladimir Seidel, Stefan Serghiesco, I. M. Sheffer, Jacob Sherman, Max Shiff-

man, J. A. Shohat, C. G. Shover, L. P. Siceloff, L. L. Silverman, L. G. Simons, James Singer, C. E. Smith, P. A. Smith, W. M. Smith, Virgil Snyder, V. E. Spencer, G. W. Starcher, N. E. Steenrod, W. C. Strodt, M. M. Sullivan, J. L. Synge, J. D. Tamarkin, J. H. Taylor, J. M. Thomas, T. Y. Thomas, C. B. Tompkins, J. I. Tracey, A. W. Tucker, J. W. Tukey, Annita Tuller, H. L. Turrittin, J. L. Vanderslice, Oswald Veblen, R. L. Vitale, R. J. Walker, S. E. Warschawski, C. W. Watkeys, Warren Weaver, Louis Weisner, M. J. Weiss, A. P. Wheeler, H. S. White, A. L. Whiteman, Hassler Whitney, G. T. Whyburn, D. V. Widder, Norbert Wiener, L. R. Wilcox, S. S. Wilks, John Williamson, W. A. Wilson, Aurel Wintner, H. P. Wirth, W. H. Wise, B. C. Wong, D. W. Woodard, Oscar Zariski, Leo Zippin, O. J. Zobel, H. S. Zuckerman.

The meeting opened on Friday morning with two sectional sessions, one for Algebra and Statistics and one for Analysis and Geometry. Friday afternoon was devoted to a symposium on Laplace integrals at which the following addresses were delivered: *Functions analytic in a half plane and Laplace transforms*, by Professor J. D. Tamarkin; *Summability of Laplace integrals*, by Professor Einar Hille; *The iterated Laplace transform*, by Professor D. V. Widder. The discussion was led by Professors H. F. Bohnenblust and Salomon Bochner.

On Saturday morning there were two sectional sessions, one for Algebra and one for Analysis and Geometry. During Saturday morning, in an adjacent room, Professor Felix Bernstein demonstrated to all interested a new machine for producing various types of statistical distributions.

On Thursday preceding the meetings of the Society, a conference on Algebraic geometry, arranged by Professor Oscar Zariski, was held. A separate report of this conference appears elsewhere in this number of the Bulletin.

A meeting of the Council was held on Saturday at 1:00 p.m. in the Faculty Club of Columbia University. The election of the following persons to membership in the Society was announced by the Secretary:

Mr. Anthony Andrew Aucoin, Louisiana State University;
Mr. Raymond Clare Briant, Mellon Institute;
Mr. John Williams Calkin, Harvard University;
Professor Harold Scott Macdonald Coxeter, University of Toronto;
Mr. Raymond Howard Cramer, The Rice Institute;
Mr. Edgar D. Eaves, University of Tennessee;
Mr. Joseph William Eberman, Gatun, Canal Zone;
Dr. Bernard Friedman, New York University;

Mr. Roy LeForest Gilman, High School of Commerce, New York, N. Y.;
Dr. Joseph Williams Hahn, American National Insurance Company, Galveston, Tex.;
Dr. Ernest Albert Hedberg, Lander College, Greenwood, S. C.;
Sister Helen Sullivan, Mount Saint Scholastica College, Atchison, Kan.;
Mr. Coleman Herpel, Pennsylvania State College;
Dr. John Tom Hurt, Texas Agricultural and Mechanical College;
Mr. James D. Hutchinson, University of Houston;
Mr. Ernest Carlton Kennedy, The Rice Institute;
Mr. H. G. Landau, Carnegie Institute of Technology;
Brother Louis De La Salle, Saint Mary's College, Winona, Minn.;
Professor Dora McFarland, University of Oklahoma;
Miss Florence Lydia Munroe, Northampton High School, Northampton, Mass.;
Mr. John Purcell Nash, The Rice Institute;
Dr. Louis Albert Pipes, The Rice Institute;
Mr. Theodore H. Preiser, Mental Hospital, Bnei-Brak, Palestine;
Mr. Walter Tandy Scott, The Rice Institute;
Professor Roy Quincy Seale, Corpus Christi Junior College, Corpus Christi, Tex.;
Professor Elizabeth Cherry Strayhorn, Western Kentucky State Teachers College;
Dr. Abraham Haskel Taub, University of Washington;
Mr. Suvan T. Vadhana, University of Michigan.

As nominees of the University of California at Los Angeles:

Mr. John LeRoy Kelley, University of California at Los Angeles;
Mr. Ralph S. Phillips, University of Michigan.

As nominees of The Institute for Advanced Study:

Dr. Peter G. Bergmann, The Institute for Advanced Study;
Dr. Louis P. Bouckaert, Princeton University;
Dr. Herbert Busemann, The Institute for Advanced Study;
Professor Antonio Ireneo Flores, Madrid University;
Dr. James Wallace Givens, Jr., The Institute for Advanced Study;
Dr. Banesh Hoffmann, The Institute for Advanced Study;
Dr. Witold Hurewicz, University of Amsterdam;
Dr. Norman Levinson, The Institute for Advanced Study;
Professor Walther Mayer, University of Vienna;
Dr. Otto Franz Georg Schilling, The Institute for Advanced Study.

As nominees of the University of Pennsylvania:

Mr. Ebon Elbert Betz, University of Pennsylvania;
Mr. Albert Leon Whiteman, University of Pennsylvania.

It was announced that the following person had entered the Society under the reciprocity agreement with the London Mathematical Society:

Mr. Kenneth Povey, Queen's University, Belfast.

The following institution was elected to institutional membership in the Society:

University of Notre Dame.

The following appointments were announced: as representative of the Society at the Centenary Celebration of the Founding of Mt. Holyoke College on May 7–8, 1937, Professor N. H. McCoy; as representatives of the Society on the Council of the American Association for the Advancement of Science for 1937, Professors M. H. Ingraham and G. T. Whyburn; as Committee on Arrangements for the 1937 Annual Meeting, Professor K. P. Williams (chairman), Dr. B. C. Getchell, Professors T. R. Hollcroft, M. H. Ingraham, and Miss Juna M. Lutz; as Committee on Printing Contracts, Professors D. R. Curtiss (chairman), M. H. Ingraham, C. C. MacDuffee.

Future meetings of the Society are to be as follows: Iowa City, November 26–27, 1937; Indianapolis, December 28–30, 1937; New York City, February 26, 1938; Charlottesville, April 15–16, 1938; Chicago, April, 1938; Madison, summer, 1939.

It was announced that Professor John von Neumann had accepted the invitation to give the Colloquium Lectures in 1937 in place of Professor Jesse Douglas who resigned because of ill health, and that his subject will be *Continuous geometry*.

It was reported that Professor E. R. Hedrick, on account of his appointment as Vice-President and Provost of the University of California at Los Angeles, is resigning his position as Editor-in-chief of the Bulletin but will continue to be an Editor. Professor D. R. Curtiss was appointed Managing Editor for the remainder of this year. Resolutions were adopted expressing appreciation for the services of Professor Hedrick.

A report from the Committee on the Semicentennial Celebration of the Founding of the American Mathematical Society was presented by Executive Secretary T. C. Fry. The main features of this report are to be published separately in the Bulletin.

The Preliminary Committee on the International Congress of Mathematicians, consisting of Professors G. A. Bliss, E. W. Chittenden, A. B. Coble, L. P. Eisenhart, G. C. Evans, E. R. Hedrick, T. H. Hildebrandt, Einar Hille, J. R. Kline, H. M.

Morse, P. A. Smith, M. H. Stone, J. D. Tamarkin, J. L. Walsh, and Norbert Wiener, through its chairman, Dean L. P. Eisenhart, presented an extensive report outlining the organization of preparations for the Congress. The Congress is to be held in Cambridge, beginning about September 4, 1940, with Harvard University, Massachusetts Institute of Technology, and Radcliffe College acting jointly as hosts. To nominate officers and committees for the Congress, the following committee was appointed: Professors D. V. Widder (chairman), A. B. Coble, L. M. Graves, H. H. Mitchell, J. F. Ritt.

Titles and cross references to the abstracts of the papers (other than symposium addresses) read at this meeting follow below. Papers whose abstract numbers are followed by the letter *t* were read by title. The papers numbered 1 to 12 were read before the section for Algebra and Statistics, Professor J. F. Ritt presiding; those numbered 13 to 23 before the section for Analysis and Geometry, Professors Virgil Snyder and J. L. Synge presiding; those numbered 24 to 33 before the Saturday morning section for Algebra, Number Theory, and Group Theory, Professor Harold Hotelling presiding; those numbered 34 to 42 before the Saturday morning section for Analysis and Geometry, Professor W. A. Wilson presiding; besides, papers numbered 43 to 61 by title. Professor Norbert Wiener presided at the symposium. Mr. G. C. Watson was introduced by Professor G. T. Whyburn and Mr. H. A. Arnold by Professor A. D. Michal.

1. *The conjunctive equivalence of pencils of hermitian and antihermitian matrices*, by Dr. John Williamson. (Abstract 43-3-161.)

2. *Infinite symmetric differences.* I, *Absolute convergence* (preliminary report), by Dr. H. M. MacNeille. (Abstract 43-3-132.)

3. *The insolubility of quintic equations*, by Mr. Garrett Birkhoff. (Abstract 43-3-110.)

4. *A representation of generalized Boolean rings*, by Professors N. H. McCoy and Deane Montgomery. (Abstract 43-3-135.)

5. *Extension of a theorem of Markoff*, by Professor Oystein Ore. (Abstract 43-3-137.)

6. *On a general class of consistent definitions of summability*, by Professor L. L. Silverman. (Abstract 43-3-148.)

7. *A matching problem*, by Dr. J. A. Greenwood. (Abstract 43-3-123.)

8. *The generalized analysis of variance*, by Mr. W. G. Madow. (Abstract 43-3-134.)

9. *The large-sample distribution of the likelihood ratio for composite hypotheses*, by Professor S. S. Wilks. (Abstract 43-3-160.)

10. *Sampling distributions related to determinantal equations*, by Mr. M. A. Girshick. (Abstract 43-3-122.)

11. *Gaussian and Laplacian statistics*, by Professor Felix Bernstein. (Abstract 43-5-259.)

12. *Real symmetric trilinear forms*, by Professor Rufus Oldenburger. (Abstract 43-3-136.)

13. *General self-adjoint boundary conditions for second order partial differential operators of elliptic type* (preliminary report), by Mr. J. W. Calkin. (Abstract 43-3-114.)

14. *The differential geometry of series of lineal elements*, by Mr. J. J. De Cicco. (Abstract 43-5-260.)

15. *Generalizations of affine geometry*, by Dr. L. R. Wilcox. (Abstract 43-3-159.)

16. *Superimposition of decompositions in continuous geometries*, by Dr. Israel Halperin. (Abstract 43-3-125.)

17. *Critical curvatures in Riemannian spaces*, by Professor A. B. Brown. (Abstract 43-3-111.)

18. *Concerning Appell sets and linear functional equations*, by Professor I. M. Sheffer. (Abstract 43-3-145.)

19. *A new proof of the Euler-Lagrange equation*, by Professor Karl Menger. (Abstract 43–5–262.)

20. *Soap film experiments on the problem of Plateau and Douglas*, by Professor Richard Courant. (Abstract 43-3-117.)

21. *Minimal surfaces with prescribed contours not having least area*, by Mr. Max Shiffman. (Abstract 43-3-146.)

22. *The four-vertex theorem for a certain type of space curve*, by Professor W. C. Graustein and Mr. S. B. Jackson. (Abstract 43-5-261.)

23. *Elliptical moments*, by Professor C. J. Rees. (Abstract 43-3-140.)

24. *Equivalence of pairs of matrices*, by Dr. M. M. Flood. (Abstract 43-3-121.)

25. *Simple Lie algebras of type A*, by Dr. Nathan Jacobson (National Research Fellow). (Abstract 43-3-128.)

26. *On the coefficients of the series for the partition function*, by Dr. D. H. Lehmer. (Abstract 43-3-130.)

27. *On the convergence properties of the Lagrange interpolation formula based on the zeros of orthogonal polynomials*, by Professor J. A. Shohat. (Abstract 43-3-147.)

28. *The singular series for polynomials*, by Professor Leonard Carlitz. (Abstract 43-3-116-*t*.)

29. *Theory of quasi-groups*, by Mr. B. A. Hausmann and Professor Oystein Ore. (Abstract 43-3-126.)

30. *Group rings and extensions*. I, by Dr. Marshall Hall. (Abstract 43-3-124.)

31. *An improvement of Brun's method in number theory* (preliminary report), by Dr. J. B. Rosser. (Abstract 43-3-142.)

32. *On the paradox of Kleene and Rosser*, by Professor H. B. Curry. (Abstract 43-3-118.)

33. *The absolute optical instrument*, by Professor J. L. Synge. (Abstract 43-3-151.)

34. *On integration in vector spaces*, by Mr. B. J. Pettis. (Abstract 43-3-138.)

35. *Concerning homeomorphisms and interior transformations*, by Dr. G. E. Schweigert. (Abstract 43-3-144.)

36. *On interior transformations*, by Professor G. T. Whyburn. (Abstract 43-1-80.)

37. *On polyhedral manifolds and differentiable manifolds*, by Professor S. S. Cairns. (Abstract 43-3-113.)

38. *A series of involutorial Cremona transformations in S_n belonging multiply to a non-linear line complex*, by Professors Virgil Snyder and Evelyn Carroll-Rusk. (Abstract 43-3-149.)

39. *Fixed points and the extension of the homeomorphisms of a planar graph*, by Dr. Saunders MacLane and Professor V. W. Adkisson. (Abstract 43-3-131.)

40. *On cocycles and products in a complex*, by Professor Hassler Whitney. (Abstract 43-3-156.)

41. *On a certain restricted class of convex functions* (preliminary report), by Dr. I. J. Schoenberg. (Abstract 43-3-143.)

42. *Decompositions and dimension of closed sets in R^n*, by Mr. A. N. Milgram. (Abstract 43-5-263.)

43. *Projections of algebraic varieties* (preliminary report), by Professor B. C. Wong. (Abstract 43-3-162-*t*.)

44. *On lattices of hyperplanes.* II, by Mr. Garrett Birkhoff. (Abstract 43-3-109-*t*.)

45. *Critical diameters of central quadrics*, by Professor A. B. Brown. (Abstract 43-3-112-*t*.)

46. *Higher congruences and irreducible polynomials*, by Professor Leonard Carlitz. (Abstract 43-3-115-*t*.)

47. *Regression coefficients as means of certain ratios*, by Professor E. L. Dodd. (Abstract 43-3-119-*t*.)

48. *Isometric invariants of systems of curves on a surface*, by Dr. Aaron Fialkow (National Research Fellow). (Abstract 43-3-120-*t*.)

49. *On the inversion problem of Möbius*, by Professor Einar Hille. (Abstract 43-3-127-*t*.)

50. *On cyclic connectivity and local end points*, by Dr. F. B. Jones. (Abstract 43-3-129-*t*.)

51. *Fundamental theorems of comparative statistical analysis*, by Mr. W. G. Madow. (Abstract 43-3-133-*t*.)

52. *A theorem concerning homologies in a compact space*, by Mr. W. T. Puckett. (Abstract 43-3-139-*t*).

53. *On complete systems of tensors* (preliminary report), by Mr. L. B. Robinson. (Abstract 43-3-141-*t*.)

54. *Scrolls whose asymptotic curves are cubics*, by Professor C. T. Sullivan. (Abstract 43-3-150-*t*.)

55. *A note on residuals in commutative rings*, by Professor Morgan Ward. (Abstract 43-3-153-*t*.)

56. *A note on the relation between degree of polynomial approximation and continuity in the complex domain*, by Professor J. L. Walsh and Dr. W. E. Sewell. (Abstract 43-3-152-*t*.)

57. *Almost monotone transformations*, by Mr. G. C. Watson. (Abstract 43-3-154-*t*.)

58. *Analytic coordinate systems and arcs in a manifold*, by Professor Hassler Whitney. (Abstract 43-3-155-*t*.)

59. *Interior transformations on compact sets*, by Professor G. T. Whyburn. (Abstract 43-3-157-*t*.)

60. *On the mapping of Betti groups under interior transformations*, by Professor G. T. Whyburn. (Abstract 43-3-158-*t*.)

61. *A set of independent postulates for a ring with equality undefined*, by Mr. H. A. Arnold. (Abstract 43-5-258-*t*.)

T. R. HOLLCROFT,
Associate Secretary

THE NEW YORK CONFERENCE ON ALGEBRAIC GEOMETRY

In connection with the meeting of the American Mathematical Society in New York City, March 26–27, a conference on algebraic geometry was held on March 25. Twenty-seven persons were present. The purpose of the conference was to promote the application of methods of modern algebra to problems of algebraic geometry. By bringing algebraists and geometers together in informal discussion, it was hoped to secure an exchange of ideas and points of view which would be of value to both groups of mathematicians. That this hope was abundantly realized was evident from the general and spirited discussion that followed each of the scheduled talks.

The following papers were presented informally:

Formal power series in algebraic geometry, by Professor Solomon Lefschetz.

A generalization of Lüroth's Theorem and the existence of normal extension fields with a given Galois group, by Dr. O. F. G. Schilling.

Zero-dimensional ideals in rings of integral functions of several variables and their connections with the theory of singularities, by Professor Oscar Zariski.

The arithmetic of an algebraic variety, by Professor A. Weil.

R. J. WALKER

SHORTER NOTICES

L'algèbre abstraite. By Oystein Ore. (Actualités Scientifiques et Industrielles, No. 362.) Paris, Hermann, 1936. 52 pp.

Ore's pamphlet is the sixth in the series: Exposés d'analyse générale, edited by M. Fréchet. It gives an excellent introduction to so-called abstract algebra. The fundamental concepts are defined and their significance explained. The most important theorems are stated and the direction of modern development is indicated. Proofs are not given but reference is made to a large number of books and papers.

The subjects treated are: the theory of fields under their different aspects, commutative rings and ideals, non-commutative rings, systems of hypercomplex numbers and their representations, some parts of the theory of groups, and finally structures, which last theory has been developed by Professor Ore's own investigations.

The book is clearly written and should be a great help to anyone desiring to form some general idea of this part of mathematics.

It is certainly a difficult task to present so many theories on so few pages. These difficulties Professor Ore has overcome in an admirable manner.

RICHARD BRAUER

Wahrscheinlichkeit Statistik und Wahrheit. By R. von Mises. Einführung in die neue Wahrscheinlichkeitslehre und ihre Anwendung. 2d revised edition. Edited by P. Frank and M. Schlick. (Schriften zur Wissenschaftlichen Weltauffassung, vol. 3.) Vienna, Springer, 1936. 8+282 pp.

The approach of von Mises to probability by means of "collectives" is now so well known that a detailed review of the second edition of *Wahrscheinlichkeit Statistik und Wahrheit* is hardly necessary. He defines a collective as a *sequence of observations*—and there is the nub of the difficulty. An observation is not a concept usually met in pure mathematics, and requires careful explanation. There are severe requirements laid on a sequence of observations which is to be called a collective, and it has been pointed out by many writers that these requirements are impossible of fulfillment if by a *sequence of observations* is meant a fully defined sequence of symbols, say numbers, representing the observations.* On the other hand, von Mises is apparently unwilling to go to the other extreme and state explicitly that by a *sequence of observations* he means a sequence of actual observations of an experiment which is being repeated indefinitely, but whose infinitely many results can never be obtained all together. (The rules of the *Regellosigkeit* axiom would then be decided on before the experiment started, and the axiom would become a prediction of future experimental results—a description of physical occurrences rather than a mathematical axiom.)

* More accurately: the *Regellosigkeit* axiom has no precise significance if this is to be the meaning of a *sequence of observations.*

Von Mises has attempted to take an intermediate position between these two points of view. His own point of view is not clearly defined, however, and most criticism has supposed that he adopted the first. His principal justification has been that no contradiction will be derived, using his axioms. Now it can be shown that the ordinary probability calculus can be developed fully using his axioms, and that in such a development no contradiction will ever be obtained—the axioms lead to a consistent set of rules of procedure. But absence of contradiction on such a level cannot be the main justification of a mathematical theory to any mathematician who believes his science is more than a chess-like game: surely a set of rules of procedure should have an acceptable base. What is desired is a mathematical theory which runs parallel to the physical facts, when properly idealized, but which has its own independent justification.

This edition of *Wahrscheinlichkeit Statistik und Wahrheit* contains a considerably enlarged critique of various theories of probability which will be of lasting value to all students of the subject.

J. L. Doob

Wahrscheinlichkeitsrechnung und allgemeine Integrationstheorie. By E. Tornier. Leipzig and Berlin, Teubner, 1936. 6+158 pp.

In the last few years, the theory of probability has been more and more influenced by the modern theories of measure. Professor Tornier gives a striking proof of this in devoting 100 of the 158 pages of his *Wahrscheinlichkeitsrechnung* to an interesting and fairly complete development of (Jordan) content and (Lebesgue) measure theories—treated from an abstract standpoint. The reader is warned in the introduction not to be deterred by this heavy array of pure mathematics: "so much mathematics is needed precisely in order to avoid reducing living basic intuitions into lifeless formalism, as results, for example, from an identification of probability with Lebesgue measure—inspired by the analogy in the rules of calculation." As we shall see, the author rejects Lebesgue measure in favor of Jordan measure, thus avoiding lifeless formalism.

Consider the theory of probability as applied to the analysis of the repeated casting of a single die, marked in the usual way. Any sequence $(n_1, n_2, \cdots)$ is logically possible, where n_j is one of the integers 1, 2, 3, 4, 5, 6. Tornier assigns probabilities to certain classes of these sequences. Thus to the class of all sequences for which $n_1=4$ (representing the possibility of casting a 4 the first time), is assigned the probability 1/6. More generally, if $a_1, \cdots, a_\nu$ is any finite set of integers between 1 and 6, the class of all sequences for which $n_j=a_j, j=1, \cdots, \nu$, is given probability $1/6^\nu$. These sets of sequences are called basic sets, and assigning these probabilities to the basic sets and prescribing the usual additive property of probability determines a probability measure—a set function defined on certain sets of sequences. This probability measure can be taken as (Jordan) content or (Lebesgue) measure, depending on the extent of the field of sets on which probability is defined. Now the author uses in a fundamental way special classes of sequences $(n_1, n_2, \cdots)$ having an intimate connection with the field of Jordan measurable sets determined by the basic sets, and this connection cannot be extended to the more general field of

Lebesgue measurable sets determined by the basic sets. It is through these special sequences that the probability measure is related to the usual frequency interpretation of probability. It is therefore impossible for him to assign probabilities to all Lebesgue measurable sets and retain the frequency interpretation, and he concludes that it is impossible to combine a frequency concept with the use of all measurable sets. That the difficulty is not in the problem but in the attack is shown by many papers in the literature which utilize the field of Lebesgue measurable sets on this very space of sequences, and do not abandon the frequency interpretation.* Tornier does not refer to such papers, but claims that the identification of probability with Lebesgue measure has "deprived probability theory of its independent existence, and made it into an empty mathematical formalism without content and without any connection with the external world, whose calculated results even lack any conceivable possibility of experimental verification." Such strong language was unusual in the mathematical works of a less heroic era. Even now it should be followed by some supporting evidence. It should be noted parenthetically that an acceptance of the formal identity of the rules of probability with the rules of measure theory, as applied to suitable spaces, would by no means imply the identity of probability and Lebesgue measure.

A striking example of the difference in results in using content and measure is one mentioned by Tornier: in the experiment discussed above, consider the event consisting of casting only 3's with the die, after some stage. The corresponding class of sequences $(n_1, n_2, \cdots)$ is not in the Jordan field over the basic sets, so the Tornier method does not give the event a determinate probability p, and Tornier shows that any number between 0 and 1 (inclusive) can consistently be assigned to it. There is no indication as to how p is to be chosen, or whether its choice is determined at all by the actual experiment. The other approach assigns to this event the probability 0. The use of Jordan measure also causes certain changes in well known theorems. For instance if $\mathbf{x}$ is a chance variable, the probability that $\mathbf{x}<c$ may not be defined for all values of c: a denumerable exceptional set is possible. This fact changes such statements as that of Markoff's Lemma in an obvious way.

The author's purpose was to show how his approach leads to a consistent theory of probability, and he has done this in a clearly written book.

J. L. Doob

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* Cf. for example A. Khintchine, Zeitschrift für angewandte Mathematik und Mechanik, vol. 13 (1933), pp. 101–103; E. Hopf, Journal of Mathematics and Physics of the Massachusetts Institute of Technology, vol. 13 (1934), pp. 51–102; J. L. Doob, Transactions of this Society, vol. 36 (1934), pp. 759–775; S. Ulam and Z. Lomnicki, Fundamenta Mathematicae, vol. 23 (1934), pp. 237–278. Numerous earlier papers adopted the same point of view without using the specific terminology of probability.

NOTES

Professor E. R. Hedrick, after serving as Editor-in-Chief of this Bulletin for seventeen years, has resigned from this position because of his appointment, beginning March 19, 1937, as Vice-President of the University of California and Provost of the University of California at Los Angeles. He will remain a member of the board of editors. Professor D. R. Curtiss has been designated Managing Editor for the balance of this year. Professor Derrick N. Lehmer has resigned as Assistant Editor and has been replaced by Professor Paul A. Smith.

A quarterly devoted to an integration of the scientific disciplines and to a study of the interdependence of science and society has recently commenced publication under the title *Science and Society: A Marxian Quarterly*. The editors are A. E. Blumberg, E. B. Burgum, V. J. McGill, Margaret Schlauch, and B. J. Stern. Among the foreign editors are J. D. Bernol of Cambridge, Paul Langevin of the Collège de France, and H. Levy of the Imperial College of Science, London.

The symposium on the calculus of variations at the University of Notre Dame, announced in the March number of this Bulletin, was held April 7 and 8, in four sessions. Fifty mathematicians, from all parts of the country, were present. Professor H. M. Morse presided at the first session, on Wednesday morning, where the following papers were presented: *Normality and abnormality in the calculus of variations*, by Professor G. A. Bliss; *The reduction of certain problems in the calculus of variations to the problem of Bolza*, by Professor L. M. Graves. At the session on Wednesday afternoon, Professor G. A. Bliss presiding, the following papers were presented: *The method of variation of the independent variable*, by Professor Tibor Radó; *Expansion methods in the calculus of variations*, by Dr. W. T. Reid; *Certain aspects of differential geometry in the large*, by Dr. S. B. Myers. On Wednesday evening Professor Solomon Lefschetz gave a general lecture entitled, *What is Topology?* On Thursday morning Professor Lefschetz presided, and the following papers were presented: *Abstract variational theory*, by Professor Marston Morse; *Existence theorems in the calculus of variations*, by Professor E. J. McShane. At the last session, on Thursday afternoon, Professor Lincoln La Paz presiding, the following papers were presented: *Metric methods in the calculus of variations*, by Professor Karl Menger; *Applications of the calculus of variations to economics*, by Professor C. F. Roos; *The variation principles in quantum electrodynamics*, by Professor L. W. Wordheim; *The variation principles of Maupertuis and Fresnel, and the relation between wave mechanics and the theory of relativity*, by Profesor A. E. Haas.

A joint session of Sections A and K of the American Association for the Advancement of Science, and of the Econometric Society, will be held at Denver on the morning of June 24, 1937. The following papers will be presented: *Incidence of taxation in a simplified general equilibrium*, by Mr. R. W.

Shepard; *On mechanical quadratures*, by Professor J. A. Shohat; *Stability of regimes of cooperation and competition*, by Professor G. C. Evans and Mr. Kenneth May; *A certain index number as a mean* $f(x_1, x_2, \cdots x_n)$ *with* $f(c, c, \cdots c)$ *defined only when* $c=1$, by Professor E. L. Dodd; *Applications of index numbers to the general economic equilibrium*, by Mr. F. W. Dresch; *The economic meaning of functionals*, by Dr. Gerhard Tintner.

Dr. Georges Bouligand, professor of differential and integral calculus at the University of Poitiers, has been elected correspondent of the Section of Mechanics of the Paris Academy of Sciences, in succession to the late Dr. Joseph Auclair.

Dr. Georg Aumann has been appointed to a professorship in mathematics at the University of Frankfort.

Dr. Udo Wedner, of the Technical School at Darmstadt, has been appointed to a professorship at the University of Heidelberg.

Dr. Julius Wellstein, of the Technical School at Karlsruhe, has been appointed to a professorship in mechanics at the University of Wurzburg.

The following eighty-two doctorates, with mathematics or mathematical physics as a major subject, were conferred during 1936 in universities in the United States and Canada; the major subject is mathematics unless otherwise specified. The university, month in which the degree was conferred, minor subject (other than mathematics), and the title of the dissertation are given in each case if available.

M. R. Anderson, Chicago, August, *Representation as a sum of multiples of polygonal numbers.*

H. C. Ayres, California (Berkeley), December, *Existence and embedding theorems for a hyperbolic system of partial differential equations.*

A. H. Bailey, Ohio State, June, *An approach to the study of conic sections, based on a group of projective transformations.*

John Bardeen, Princeton, January, *Quantum theory of the work function.*

R. H. Bardell, Chicago, August, *The inequalities of Morse for a parametric problem of the calculus of variations.*

J. W. Blincoe, Virginia, June, *The reduction of plane quartic curves to canonical forms by means of their euclidean concomitants.*

L. H. Bowen, Cornell, June, minor in astronomy, *Composite double curves on rational ruled surfaces.*

J. L. Brenner, Harvard, February, *The linear homogeneous group modulo p.*

J. R. Britton, Colorado, June, minor in celestial mechanics, *Tchebychef orthogonal polynomials in a single real variable.*

J. C. Brixey, Chicago, June, *The null forms* $Ax^2+By^2+Cz^2+Du^2$ *which represent all integers.*

A. C. Burdette, Illinois, June, minor in astronomy, *On simultaneous expansions of analytic functions in composite power series.*

F. A. Butter, Jr., Stanford, June, minor in physics, *A contribution to the theory of the arithmetic-geometric mean.*

J. F. Calvert, Pittsburgh, June, minor in electrical engineering, *Insulation problems in high voltage rotating machines.*

E. A. Cameron, North Carolina, August, *On loci associated with certain osculants of a plane curve.*

J. E. Case, S. J., Chicago, March, *The behavior of the Hessian at a multiple point of a curve.*

George Comenetz, Columbia, January, *Curvature trajectories.*

E. G. H. Comfort, Brown, June, *On the preservation of Hölder properties of initial conditions in the solutions of wave equations.*

D. C. Dearborn, Duke, June, minor in applied mathematics, *Inequalities among the invariants of Pfaffian systems.*

D. B. De Lury, Toronto, June, *On the representation of numbers by certain indefinite quadratic forms.*

D. M. Dribin, Chicago, March, *Representation of binary forms by sets of ternary forms.*

Nelson Dunford, Brown, June, I. *Integration in general analysis*; II. *On a theorem of Plessner*; III. *A particular sequence of step functions.*

P. S. Dwyer, Michigan, June, *Combined expansions of products of symmetric power sums and of sums of symmetric power products with application to sampling.*

Aaron Fialkow, Columbia, June, *Trajectories and lines of force.*

Sidney Frankel, Rensselaer Polytechnic Institute, June, *On the expansion of functions in series of functions.*

Bernard Friedman, Massachusetts Institute of Technology, June, minor in physics, *Analyticity of equilibrium figures of rotation.*

J. W. Givens, Jr., Princeton, June, *Tensor coordinates of linear spaces.*

André Gleyzal, Ohio State, June, *On transfinite real numbers, general orders, Riemannian and Finsler spaces.*

H. H. Goldstine, Chicago, August, *Conditions for a minimum of a functional.*

J. W. Hahn, Rice Institute, June, *Projective transformations in two complex variables.*

Marshall Hall, Yale, June, *An isomorphism between linear recurring sequences and algebraic rings.*

Israel Halperin, Princeton, April, *Adjoints and closures of linear differential operators.*

H. J. Hamilton, Brown, June, I. *On transformations of double series*; II. *Transformations of multiple sequences.*

R. A. Harrison, Cornell, June, minor in education, *Cremona webs in S_3 without base curves.*

O. G. Harrold, Jr., Stanford, June, minor in physics, *On the expansion of the remainder in the open-type Newton-Cotes quadrature formula.*

Archie Higdon, Iowa State, June, major in applied mathematics, minor in physics, *Stresses in moderately thick plates.*

I. E. Highberg, California Institute of Technology, June, minor in physics, *Polynomials in abstract spaces.*

J. D. Hill, Brown, October, I. *Some theorems on double limits*; II. *A theorem in the theory of summability*; III. *On perfect methods of summability.*

C. C. Hurd, Illinois, June, minor in economics, *Properties of solutions of linear differential equations containing a parameter.*

L. P. Hutchison, Kentucky, August, *On implicit functions and Lagrange multiplier theorems.*

V. P. Jensen, Iowa State, June, major in applied mathematics, minor in structural engineering, *The application of conformal transformation theory to the determination of stress problems.*

M. L. Kales, Brown, October, *Tauberian theorems related to Borel and Abel summability.*

Morris Kline, New York, June, minor in physics, *Homomorphism and isomorphism of rings and fields of point sets.*

Sister Mary Thomas à Kempis Kloyda, Michigan, February, *Linear and quadratic equations*, 1550–1660.

G. B. Lang, Illinois, February, minor in physics, *On finite systems of linear differential equations of infinite order with constant coefficients.*

H. D. Larsen, Wisconsin, March, minor in applied mathematics, *On the bias in the simple arithmetical index number.*

Madeline Levin, Bryn Mawr, June, *An extension of the Lefschetz theory of intersection.*

Dora McFarland, Chicago, August, *Division algebras defined by non-Abelian groups.*

J. C. C. McKinsey, California (Berkeley), May, *On Boolean functions of many variables.*

Harry Matison, Princeton, June, *On certain classes of integral functions.*

A. E. May, Wisconsin, June, *On the equivalence of pairs of Hermitian matrices in* $R(\sqrt{k})$.

L. E. Mehlenbacher, Michigan, June, *The interrelations of the fundamental solutions of the hypergeometric equation.*

L. L. Merrill, Rensselaer Polytechnic Institute, June, minor in physics, *The direct determination of a function knowing the infinite sum of its successive integrals.*

W. A. Mersman, California Institute of Technology, June, minor in physics, *Abstract integration.*

A. H. Odoms, Cincinnati, June, *On the summability of double Fourier series.*

W. A. Patterson, Ohio State, June, *Inverse problems of the calculus of variations for multiple integrals.*

E. L. Peterson, Purdue, June, major in mathematical physics, minors in mathematics, physics, and chemistry, *A wave mechanical computation of the resistivity of metallic sodium.*

Walter Prenowitz, Columbia, June, *The characterization of plane collineations in terms of homologous families of lines.*

E. S. Quade, Brown, June, I. *The category of the class* Lip (α, ρ); II. *A generalized Parseval's relation*; III. *A note on Lipschitz classes*; IV. *Trigonometric approximation in the mean for functions in the class* Lip (α, ρ).

R. B. Rasmusen, Chicago, December, *Conjugate osculating quadrics associated with the lines of curvature.*

Sister Henrietta Reilly, Catholic University, June, minors in physics and education, *Self-symmetric quadrilaterals in- and circumscribed to the plane rational quartic curve with a line of symmetry.*

Moses Richardson, Columbia, October, *On the homology characters of symmetric products.*

J. S. Rosen, Washington University, St. Louis, June, minor in physics, *Some generalizations of Bessel functions.*

Benjamin Rosenbaum, Yale, June, *On divisibility and irreducibility.*

Arthur Sard, Harvard, February, *The measure of the critical values of functions.*

A. C. Schaeffer, Massachusetts Institute of Technology, June, minor in physics, *Existence theorem for the flow of an ideal incompressible fluid in two dimensions.*

Brother Louis De La Salle Seiler, Catholic University, June, minors in physics and education, *Investigation of the basis numbers and class number of higher algebraic domains.*

W. E. Sewell, Harvard, February, *Generalized derivatives and approximation by polynomials.*

M. E. Shanks, State University of Iowa, August, minor in physics, *Properties of analytic functions on regions bounded by irregular curves.*

O. T. Snodgrass, Missouri, August, *Multiplicative representation of the elements of a ring.*

T. H. Southard, Ohio State, September, *On certain projective geometries and their relation to algebra.*

V. E. Spencer, Pennsylvania, June, *Persymmetric determinant and Jacobi matrix expressions for orthogonal Tchebychef polynomials.*

N. E. Steenrod, Princeton, June, *Universal homology groups.*

Alvin Sugar, California (Berkeley), December, *Researches on Waring's problem for cubic polynomials.*

A. G. Swanson, Michigan, June, *Factorial moments.*

A. E. Taylor, California Institute of Technology, June, minor in physics, *Analytic functions in general analysis.*

C. B. Tompkins, Michigan, February, *A type of integral invariant associated with a defined class of N-dimensional variety in euclidean* $(2N\text{-}1)$*-space.*

S. B. Townes, Chicago, August, *Reduced positive quaternary quadratic forms.*

W. S. Turpin, Johns Hopkins, June, *On the fundamental group of a certain class of plane algebraic curves.*

D. L. Webb, California Institute of Technology, June, minor in physics, *Many-valued logics.*

E. P. Wiggin, Chicago, June, *A boundary value problem of the calculus of variations.*

W. L. Williams, Chicago, August, *Permanent configurations in the problem of five bodies.*

H. S. Zuckerman, California (Berkeley), May, *New results for the number* $g(n)$ *in Waring's problem.*

The following doctorates were conferred in 1935 but not included in the list in the preceding volume of this Bulletin (vol. 42, pp. 309–312):

R. W. Cowan, California (Berkeley), December, *The solution of the linear homogeneous difference equation of the second order with quadratic coefficients.*

W. L. Hutchings, California (Berkeley), May, *On a certain canonical form of a system of two linear homogeneous differential equations of the second order, with applications to the theory of ruled surfaces.*

A. R. Noble, California (Berkeley), September, *On the enumeration of uniform squares.*

J. H. D. Teller, Kentucky, August, *On a class of quaternion algebras.*

J. M. Thompson, California (Berkeley), December, *Mathematical theory of production stages in economics.*

Mr. N. B. Allison, of the University of Kentucky, has been appointed professor of mathematics at Kentucky Wesleyan College, Winchester, Ky.

Dr. E. W. Anderson, of Iowa State College, has been promoted to an assistant professorship.

Dr. S. F. Barber, of the State University of Iowa, has been promoted to an assistant professorship.

Dr. A. H. Black has been appointed to an associate professorship at Lebanon Valley College, Annville, Pa.

Dr. Niels Bohr, director of the University Institute for Theoretical Physics at Copenhagen, has been appointed to a Hitchcock professorship at the University of California, where he will lecture during the spring semester.

Professor Richard Courant has been appointed head of the department of mathematics in the Graduate School of New York University.

Associate Professor R. A. Hefner, of the Georgia School of Technology, has been promoted to a professorship.

Dr. Jack Levine, of North Carolina State College, has been promoted to an assistant professorship.

Professor E. H. McAlister, of Oregon State College, having reached the age of seventy, has retired with the title of professor emeritus of mathematics. He has been connected with the Oregon state system of higher education for forty-six years.

Dr. M. H. Martin has been appointed to an assistant professorship at the University of Maryland.

Associate Professor Susan M. Rambo, of Smith College, has been promoted to a professorship. She has been granted leave of absence for this semester.

Dr. Nathan Schwid, formerly of the University of Wisconsin, has been appointed adjunct professor of mathematics at the Texas College of Mines and Metallurgy.

Associate Professor J. H. Simester, of the University of Louisville, has been promoted to an associate professorship.

Dr. F. C. Smith has been promoted to an assistant professorship in mathematics at the College of St. Francis.

Professor Oswald Veblen, of the Institute for Advanced Study, has been appointed to a Walker Ames professorship in mathematics for the first term of the 1937 summer session at the University of Washington. He will conduct a seminar in the theory of spinors, and will be assisted by Dr. A. H. Taub, formerly of Princeton.

Associate Professor Oscar Zariski, of Johns Hopkins University, has been promoted to a professorship.

The following appointments to instructorships are announced: Brown University: Dr. M. L. Kales; University of Illinois: Dr. W. S. Turpin; Massachusetts Institute of Technology: Dr. Norman Levinson; Princeton University: Mr. R. H. Fox, Dr. N. E. Steenrod; University of Wisconsin: Dr. C. B. Allendoerfer.

Dr. F. S. Macaulay, of Cambridge, England, died on February 9, 1937, at the age of seventy-four years. He was noted for his original work in the general theory of algebraic polynomials. He had been a life member of the Society since 1898.

Dr. C. W. Crockett, professor emeritus of mathematics and astronomy at Rensselaer Polytechnic Institute, died on December 30, 1936, at his home in Troy, N. Y. At the time of his retirement in June, 1934, he had completed fifty years of service on the faculty, having been appointed upon his graduation from Rensselaer in June, 1884.

Professor Raymond Hitchcock, head of the department of mathematics, University of North Dakota, died on March 11, 1937, at the age of fifty-six. He came to the University of North Dakota in 1910, and had been head of the department since 1915.

Dr. Elihu Thomson, noted for his discoveries in electricity, died on March 13, 1937, at his home in Swampscott, Mass., at the age of eighty-three years. He was director of the Thomson Research Laboratory of the General Electric Company.

ABSTRACTS OF PAPERS

SUBMITTED FOR PRESENTATION TO THE SOCIETY

The following papers have been submitted to the Secretary and the Associate Secretaries of the Society for presentation at meetings of the Society. They are numbered serially throughout this volume. Cross-references to them in the reports of the meetings will give the number of this volume, the number of this issue, and the serial number of the abstract.

246. Professor L. E. Dickson: *First theory of homogeneous diophantine equations of degree two.*

The methods of Gauss and others yield only rational solutions and not exclusively integral solutions as claimed. When one solution in integers is given, the equation may be reduced to $zw=Q(x_1, \cdots, x_n)$. When $n=2$ the complete solution in integers is obtained by as many independent sets of formulas as there are classes of binary quadratic forms f having the same discriminant as Q. The generalized composition of forms f, and the resulting group of $h+h'$ classes if $h'=h$, where h is the number of all properly primitive classes and h' is the number of all improperly primitive classes of the same determinant, are considered for the cases $n=4$, 3, and 8. (Received March 8, 1937.)

247. Mr. Harold Chatland: *The asymptotic Waring problem for homogeneous polynomial summands.*

The asymptotic theory for homogeneous polynomial summands is developed in a manner somewhat similar to that given by L. E. Dickson (Annals of Mathematics, vol. 37 (1936), pp. 293–316). Modifications of some methods used in his paper are necessary to overcome difficulties not arising in the problem for nth powers. In this new problem the number of summands required is less than the number required when only nth powers are taken as summands. (Received March 8, 1937.)

248. Dr. J. L. Doob: *Stochastic processes depending on a discrete-valued parameter.*

The purpose of this paper is to set up the measure relations for the most general discrete stochastic process (that is one depending on a parameter running through integral values) and to show the significance of the conditional probability functions. The derivation of the conditional probability functions from the measure relations of the process, the reverse of the usual treatment, allows full generality, but introduces new difficulties. Applications are made to special cases, and new results are obtained for Markoff chains. (Received March 8, 1937.)

249. Professor Fritz John: *Representation of Stieltjes integrals by infinite series.* II.

Various infinite series representing integrals of arbitrary functions have been given by the author (Mathematische Annalen, vol. 110 (1935), p. 718, and a paper appearing in the American Journal of Mathematics) and by H. Rademacher (American Journal of Mathematics, vol. 58 (1936), p. 169). The present paper gives formulas of a more general kind. Let $f(x)$ and $g(x)$ be such that the Riemann-Stieltjes integral $I=\int_a^b f(x)dg(x)$ exists. Let there be given a sequence of subdivisions containing one another, the nth subdivision being $a=c_0^n<c_1^n<\cdots<c_{r_n}^n=b$, and let $c_i^{n-1}\leqq\eta_i^n\leqq c_i^n$. Then I can be represented by a convergent series of the form $\sum[g(c_r^n)-g(c_{r-1}^n)]\,[f(\eta_r^n)-f(\eta_\mu^n)]$. As a special case the formula $\int_1^\infty f(x)dg(x)=\sum_{\mu=1}^{r}[f(2\mu+1)-f(2\mu)]\,[g(2\mu+2)-g(2\mu+1)]$ is derived for every f and g for which the integral exists and $g(2)=g(1)$. (Received March 8, 1937.)

250. Professor Fritz John: *Normal forms of convex regions under affine transformations.*

The classes of plane convex regions which are equivalent under affine transformations are considered. A rule by which, from every such class, an element is chosen in a unique manner (except for similarity transformations) is called a normalization, and a region is called normal if it is the chosen representative of its class. As normal elements may be taken, for example, the regions for which the central ellipse of inertia is a circle (see the author's abstract 41-11-402), or those for which the ratio of the greatest and least distance between two parallel lines of support is least (see the paper of F. Behrend, Mathematische Annalen, vol. 114 (1937), p. 713). The normalizations of the two latter examples are continuous in a certain sense. It is proved that if to every direction in space a convex region corresponds in a continuous manner, then among those regions is at least one normal one, given any continuous normalization. Various applications of this theorem are discussed. (Received March 8, 1937.)

251. Professor E. J. McShane: *Existence theorems for single integral problems in the calculus of variations.*

The problem first considered is that of minimizing an integral $\int g(x, y, \dot{x}, \dot{y})d^s$ (where $y=(y_1, \cdots, y_n)$) in a class of curves $x=x(t)$, $y=y(t)$ with $\dot{x}(t)\geqq 0$. The existence of a minimizing curve is shown for problems in which g is lower semi-continuous as a function of $(x, y, \dot{x}, \dot{y})$, is positively homogeneous of degree 1 and convex in $(\dot{x}, \dot{y})$, and for each (x, y) exceeds a linear function of $(\dot{x}, \dot{y})$. If g is independent of x and $\dot{x}$, this gives a generalization of the Hahn-Tonelli existence theorem for parametric problems. If $\dot{x}(t)\equiv 1$, the problem reduces to an ordinary problem. The minimizing curve can be represented parametrically with $\dot{x}(t)\equiv 1$, if g satisfies the supplementary hypothesis that $g(x, y, 0, \dot{y})=\infty$ except for (x, y) in an exceptional set of a type here defined and studied. From the existence theorem thus derived it is easy to obtain a corollary (equivalent to the existence theorem) applying to problems involving higher derivatives. (Received March 10, 1937.)

252. Professor P. G. Hoel: *A significance test for component analysis.*

By making certain normality assumptions and treating a set of statistical variables from the component analysis point of view, a significance test is derived from the rank of a correlation matrix. The test is based upon an approximation to the sampling distribution of the generalized variance. (Received March 11, 1937.)

253. Professor W. H. Roever: *Meaning and function of a picture.*

In this paper a picture of a space object is defined as a resembling representation of this object on a plane surface. A criterion of resemblance is then stated and it is shown that this criterion is satisfied by projection. A representation or correspondence between space and the plane is defined and it is shown that at least two projections are required for its satisfaction. A stereographic picture is cited as an example of adequate pictorial representation but it is stated that such a representation could also be attained, for example, in a photograph in which the shadow of an object, as well as the object itself, is shown. In particular, the source of light casting the shadow might be in the zenith and thus, if the object were a house or some more or less rectangular object of technology, the shadow might coincide with the base of this object on the ground. Consequently one might lose sight of the fact that the picture is a double projection. Nevertheless, such a picture as, for example, the isometric projection of a piece of machinery, while giving the impression of being a single projection, possesses the property of representing each point of space by two simply related points of the picture plane. The relation between these points is shown. (Received April 7, 1937.)

254. Professor L. M. Blumenthal: *Note on the characterization of pseudo r-spheric* (S_n) *sets.* Preliminary report.

The problem (fundamental in the metric characterization of the sphere) of characterizing those semi-metric spaces that are pseudo r-spheric (S_n) has been completely solved by the writer for $n=1$ (American Journal of Mathematics, vol. 56 (1934), pp. 225–232). This note is concerned with the much more complicated case $n=2$. It is shown that if a semi-metric space (1) contains more than five points and (2) each quintuple of the space is pseudo r-spheric (S_2), then for each pair p, q of points of the space, the distance $pq=r\cos^{-1}(\pm\frac{1}{3})$, with the negative sign holding for a certain minimum number $\mu>0$ of the distances. There is reason to believe that the conclusion of the theorem might be valid under a considerable weakening of the hypothesis (2) such as, for example, merely supposing that the pseudo r-spheric space does not contain a pair of diametral points. This possibility, together with the developing of methods to treat the general case S_n, is the object of the investigations now in progress. (Received April 9, 1937.)

255. Dr. H. H. Goldstine: *The theorem of Hildebrandt.*

In this paper a new proof is given of the well known theorem of Hildebrandt (this Bulletin, vol. 29 (1923), p. 309) which plays a fundamental role in the

theory of linear operators. Not only is this proof much shorter than the one ordinarily given, but also it enables one to dispense with some of Hildebrandt's hypotheses. The proof follows immediately from a generalization of a theorem given by Banach in his monograph on linear operators (p. 19). This generalization is stated and proved in this article. (Received April 9, 1937.)

256. Dr. W. T. Reid: *On Klein's oscillation theorem for boundary problems of the calculus of variations.*

This paper contains an extension of Klein's oscillation theorem to the general differential and integro-differential boundary value problems associated with the second variation of simple integral problems of the calculus of variations. The treatment is dependent upon the previous results of the author concerning such systems involving a single characteristic parameter (see abstracts 41-1-44 and 41-5-232). (Received April 9, 1937.)

257. Mr. R. W. Wagner: *Multiple-valued functions in matrix space.*

Cipolla has shown how to extend analytic functions to matrices in a natural way. This paper investigates the new properties of the extended functions geometrically. If one is given any value of a function of a matrix A, there exist, in the subspace of matrices whose elementary divisors are of the same degrees as those of A, closed paths such that by taking A around these paths one obtains all values of the function. If the paths are taken in the subspace in which not only the elementary divisors but also the reduced characteristic function are of the same degrees, one obtains, in general, from a given value, not all values, but a class of values. The classification of values thus obtained is shown to agree with that published by Schwerdtfeger and obtained by a different method. Degenerate matrices are shown to be singular points of these functions. When A approaches a degenerate point, some of the values become infinite or depend upon the path of approach, according as the degree of the reduced characteristic function of the degenerate matrix is n or less. (Received April 9, 1937.)

258. Mr. H. A. Arnold: *A set of independent postulates for a ring with equality undefined.*

A set of ten independent postulates for a non-commutative ring is given, involving equality as an undefined notion. The properties of symmetry and transitivity are postulated for the equality relation, as well as the following: if $a=b$, then $ca=cb$, $ac=bc$ and $a+c=b+c$. The existence of at least one solution of the equation $a+x=b$ is postulated. A method is given of adding a neighborhood topology in the form of four independent postulates. A similar treatment of non-commutative fields and of linear algebras with finite bases will follow shortly. These of course will include modular fields and modular arithmetics as special cases. (Received March 27, 1937.)

259. Professor Felix Bernstein: *Gaussian and Laplacian statistics.*

Gaussian statistics are those based on the square of the deviation, Laplacian statistics, those based on the absolute value of the deviation. It can be shown that the maximum amount of information from the data will not be generally gathered by the use of the one or the other type of statistics. This situation leads to a reconsideration of the classical problems of mathematical statistics. New methods are given for determining regression and correlation. (Received March 11, 1937.)

260. Mr. J. J. DeCicco: *The differential geometry of series of lineal elements.*

The author gives some results additional to those given in a paper, *The group of turns and slides and the geometry of turbines*, by Kasner, published in the American Journal of Mathematics, vol. 33 (1911), and a paper, *The geometry of turbines and flat fields*, by Kasner and the author, which is being published in the American Journal of Mathematics. Theorem 1: Necessary and sufficient conditions that ∞^1 circular series be an osculating set are that they and their central turbines be each a set of enveloping series in such a way that corresponding elements on the two envelopes are parallel but have opposite orientations. Theorem 2: Two series for which curvature and torsion are the same functions of the angle u are equivalent under the whirl-rigid motion group. Theorem 3: If α is the angle between a supplementary section and a section with the same tangent at an element E of a field whose curvatures at E are $1/\gamma_s$ and $1/\gamma$ respectively, then $\gamma_s=\gamma\cos\alpha/2$. Theorem 4: Let $1/\gamma_0$ be the extremal supplementary curvature and λ the curvature of the point curve of the equi-parallel series at E. If δ is the distance between the centers of the tangent turbines of the extremal supplementary section and any supplementary section whose curvature is $1/\gamma_s$, then $\gamma_s=\gamma_0+\lambda\delta^2$. (Received March 12, 1937.)

261. Professor W. C. Graustein and Mr. S. B. Jackson: *The four-vertex theorem for a certain type of space curve.*

This paper presents a generalization to certain twisted closed curves of results obtained by Graustein for plane ovals (Monatshefte für Mathematik und Physik, vol. 43). The vertices of a curve are classified into primary and secondary vertices. A primary vertex is a point of the curve at which the curvature has a relative maximum (minimum) which is greater (less) than the average curvature of the curve. Any other extremum of the curvature is called a secondary vertex. The general curve considered is a closed curve of class C'' with positive, non-constant curvature, which satisfies the condition that the orthogonal projection of the tangent indicatrix on a suitably chosen plane is an oval. It is shown that for such a curve the number of primary vertices, if finite, exceeds the number of secondary vertices by at least four, and is infinite if the number of secondary vertices is infinite. (Received March 8, 1937.)

262. Professor Karl Menger: *A new proof of the Euler-Lagrange equation.*

Each curve passing through a given linear element $L_0=\{x_0, y_0, \phi_0\}$ and minimizing an integral must have the curvature of the circle which passes through L_0 and minimizes the integral in the neighborhood of the point x_0, y_0 with respect to all circles passing through L_0. It is easy to see that the latter curvature is the number which according to Euler's equation is the curvature of the extremal passing through L_0. This simple proof of the equation may also be formulated by considering for each point a single two-parametric family of curves approaching the minimizing curve while Lagrange's proof operates with a family depending on a continuous function of one-parametric families of curves. (Received March 8, 1937.)

263. Mr. A. N. Milgram: *Decompositions and dimension of closed sets in R^n.*

In this paper the author establishes a new characterization of dimension of closed sets in R^n. This may be stated as follows: A necessary and sufficient condition that a closed subset F of R^n be of dimension r (in the sense of Urysohn-Menger) is that for any sufficiently small $\epsilon>0$, F may be decomposed into the sum of a countable infinity of closed sets $F_1, F_2, \cdots, F_a, \cdots$, each of diameter less than ϵ, such that dim $F_i \cdot F_j \leqq r-1$ for any pair of integers $i \neq j$; but that for any such decomposition there exists a pair of integers $m \neq n$ such that dim $F_m \cdot F_n = r-1$. This theorem is a consequence of the following: If F is a closed subset of R^n; $F_1, F_2, \cdots$ a decomposition of F into closed sets; Z^{n-r-1} a cycle in $S(p, \epsilon)$—the interior of a sphere of radius ϵ and center p, a point of F—which does not bound in $S(p, \epsilon)-F$ but does bound in $S(p, \epsilon)-F_i$ $(i=1, 2, \cdots)$; then there exists a pair of numbers $m \neq n$ such that dim $F_m \cdot F_n \geqq r-1$. Another interesting consequence of this theorem is a generalization of a theorem due to Miss Mullikin: The sum of a countable number of closed sets, no one of which separates R^n and the dimension of whose products taken pairwise is at most $n-3$, cannot separate R^n. (Received March 12, 1937.)

264. Mr. W. H. Ingram: *Initial motion of a forced dissipative dynamical system under a sudden change in the force regime.*

The author considers a system for which $\partial L/\partial q \equiv 0$ for one or more coordinates, and it is found that the disturbed motion is initially the same as for a system in which such coordinates can be ignored. The theory has application to electrical machinery; an inspection of the equations of motion derived from Routh's function reveals, in the case of the alternator, simple algebraic relations between the numerous "transient" reactances on the one hand and the fundamental constants (inductances) appearing in T on the other. For example, $l_d' = l_d - 3M_0^2/2L$ (Philosophical Magazine, vol. 21 (1936), p. 302) where the prime follows the notation of Park and Robertson. (Received March 20, 1937.)

265. Professor L. V. Ahlfors: *An extension of Schwarz's lemma.*

In differential form Schwarz's lemma asserts that the non-euclidean element

of length decreases when the unit circle is transformed by a bounded analytic function, $|f(z)| \leqq 1$. The hyperbolic metric has the constant negative curvature -4, and the classical theorem refers to a case where the curvature is preserved. In the extension the hyperbolic metric is still considered in the z-plane, but an arbitrary conformal metric with curvature $\leqq -4$ is introduced in the function plane. It is proved that Schwarz's lemma still holds under these weaker conditions. Applications are given which yield a numerical inequality for the Picard-Schottky theorem and a new lower bound for Bloch's constant. In the applications it is important that the metric is allowed to have singularities of a certain kind, corresponding to a negatively infinite curvature. (Received April 19, 1937.)

266. Dr. M. T. Bird: *On a classification of integral functions by means of certain invariant point properties.* A supplement.

In a recent paper of Carmichael, Martin, and Bird (Transactions of this Society, vol. 40 (1936), pp. 462–473) α-sequences were defined but were not given further consideration because the authors were unable to prove their existence or non-existence. This supplement establishes the impossibility of α-sequences. Hence the point properties which the authors of the previous paper studied are seen to be significant mainly, if not entirely, for integral functions. (Received April 19, 1937.)

267. Professor Alonzo Church: *Combinatory logic as a semigroup.* Preliminary report.

By a *semigroup* is meant a set in which the product of any two elements is a unique element of the set, the multiplication being associative but not necessarily obeying a law of cancellation. Consider the system of combinators, in the sense of Rosser (Duke Mathematical Journal, vol. 1 (1935), p. 336), allowing as equivalence operations r-conversions, p-conversions, and also the operations (allowed by Curry) of replacing BI by I and inversely. This system is a semigroup, with identity element I, if we take as multiplication the operation (introduced by Curry) which is denoted by Rosser as $\times$. From the relations $\boldsymbol{ab} = T\boldsymbol{b} \times T\boldsymbol{a} \times B \times T$ and $T(\boldsymbol{ab}) = T\boldsymbol{b} \times T\boldsymbol{a} \times B$ it follows that every element is expressible as a product formed out of the four particular elements TI, TJ, B, T. The semigroup thus has a finite set of generators, although the set of generating relations must apparently be infinite. There is, however, an effective process for writing out the series of generating relations to as many terms as desired; also an effective means of distinguishing generating relations from others. From the results of the author (American Journal of Mathematics, vol. 58 (1936), pp. 345–363), it follows that the *word problem* of this semigroup is unsolvable. (Received April 14, 1937.)

268. Reverend W. C. Doyle: *A further generalization of Lambert series.*

The series here considered $\sum (a_n b_n z^{\lambda n})/(1 - a_n z^{\mu n})$ includes those of Lambert, Weierstrass, Hansen, and Garvin (American Journal of Mathematics, vol. 58 (1936), p. 507). The regions of convergence for integral values of λ and μ are

studied; and uniform convergence is established within the regions of convergence. Every power series can be expressed as a series of this generalized type; the recursion formula contains a new generalization of Möbius coefficients. (Received April 6, 1937.)

269. Dr. Norman Levinson: *On the growth of analytic functions.*

Simple function theoretic proofs are given of theorems originally due to Vladimir Bernstein on the determination of the growth of analytic functions from their growth on a set of points. A set of new and more precise theorems depending on the author's theory of non-vanishing functions are also given. (Received April 15, 1937.)

270. Professor R. L. Wilder: *Decompositions of compact metric spaces.*

Let C be a certain class of compact metric spaces, and ψ a local topological property. Then ψ is called *expansive relative to* C if, given any $M \varepsilon C$, the set S, closure of the set of non-ψ points of M, if non-vacuous, contains a continuum (compare Whyburn, this Bulletin, vol. 41 (1935), p. 95). The set of components of S together with the points of $M-S$ form the points of M', the ψ-prime part decomposition of M (see Hausdorff, *Mengenlehre*, 1935, pp. 223–224). If ψ is expansive relative to a class C of compact metric spaces, and $M \varepsilon C$, then if $M' \varepsilon C$, M' has no non-ψ points. Let C_k^m be the class of compact metric spaces that are $l.$ i-c. for $0 \leqq i \leqq k$ ($k=-1$ to indicate no $l.$ i-c. properties imposed) and whose Betti numbers p^i are finite for $0 \leqq i \leqq m$. Then the property of being $l.$ $(n+1)$-c. is expansive relative to C_n^{n+1} and the property of being $l.$ i-c. for $0 \leqq i \leqq n$ is expansive relative to C_{-1}^n. These theorems yield prime part decompositions of various spaces, as well as certain theorems concerning the decompositions of complicated domain boundaries in n-space. (Received April 15, 1937.)

271. Professor R. L. Wilder: *Property* S_n.

By a *pair* (U, V) the author means a pair of sets U and V such that $U \supset V$. The maximum number of n-cycles of V independent with respect to homologies on U is denoted by $h^n(U, V)$. By the *diameter* of a pair (U, V) is meant the diameter of U. A set M is called the *sum* of pairs (U_k, V_k) if $M=\sum U_k=\sum V_k$. A metric space M is said to have *Property* S_n if for every $\epsilon>0$, M is the sum of a finite number of pairs (U_k, V_k) of diameter $<\epsilon$ such that all $h^n(U_{n_1}+\cdots+U_{n_m}, V_{n_1}+\cdots+V_{n_m})$ are finite. Property S_0 is equivalent to the Sierpinski-Moore "Property S." Property S_n for $n>0$ yields the "justification theorems" that one would expect of a generalization of Property S. The original Sierpinski characterization of Jordan continua extends in terms of S_n for spaces $l.$ i-c. for $0 \leqq i \leqq k$; the relations of various types of locally connected sets to their complements in euclidean spaces are characterized by means of S_n; and the relations to uniform local i-connectedness and local i-connectedness established. (Received April 15, 1937.)

272. Professor R. L. Wilder: *Neighborhoods in locally connected spaces.*

Let M denote a locally compact, locally connected, metric space. Then for every point P of M and $\epsilon>0$, there exists a uniformly locally connected open neighborhood of P of diameter less than ϵ. Certain well-known theorems on spaces M are obvious corollaries of this theorem. Furthermore, the theorem itself is true for much more general spaces than the locally compact spaces. (Received April 15, 1937.)

273. Professor R. P. Agnew and Mr. A. P. Morse: *Extensions of linear functionals, with applications to limits, integrals, measures, and densities.*

The main result of this paper is that existence of a linear functional $F(x)$ (dominated by $p(x)$ as in Banach, *Théorie des Opérations Linéaires*, p. 28) which is invariant under a group G of linear transformations of its domain under which $p(x)$ is invariant, and which is an extension of a linear functional $f(x)$ dominated by $p(x)$ and invariant under G, is implied by existence of a linear extension $F_1(x)$ of $f(x)$ which is dominated by $p(x)$ and invariant under some derived group G^* of G. Corollaries and applications of this result furnish functionals invariant under groups of transformations larger than those previously known. The resulting generalized limit has (in addition to those of Banach, p. 33) the property that $\lim_{s\to\infty} x(\mu s+\lambda)=\lim_{s\to\infty} x(s)$ when μ and λ are real with $\mu>0$. The resulting generalized integrals have (in addition to those of Banach, p. 31) the property that $|\mu|\int_{-\infty}^{\infty}x(\mu s+\lambda)ds=\int_{-\infty}^{\infty}x(s)ds$ when μ and λ are real with $\mu\neq 0$. The resulting measures and densities have analogous properties. (Received April 29, 1937.)

274. Professor J. J. Gergen: *Some theorems related to number theory.*

In Part I, some theorems of the following character are obtained. Let $\phi(z)$ be an entire function of order $\leqq 1$. Let $2\lambda(r)$ denote the number of zeros of ϕ in the circle of radius r about $z=0$. Suppose that $\lambda(r)=Ar\log r+Br+o(r)$, $r\to\infty$; that $0\leqq t$, and that $\phi(it)\neq 0$. Then a necessary and sufficient condition that all the zeros of ϕ lie in the strip $|I\{z\}|\leqq t$ is found to be that $\int_0^r \log|\phi(z)\phi(\bar{z})/\phi^2(it)|\,dx/x^2=-\pi^2(A\log r+B)-\pi I\{\phi'(it)/\phi(it)\}+o(1)$, where $z=x+it$. The case $t=0$, $A=0$ is due to Wiener and Paley. Applications of the results in this part are made to $\zeta(s)$. In Part II Wiener's method of proof of the prime number theorem, which depends on Lambert series, is extended to obtain the corresponding result for the number of primes in a progression. Part III is concerned with Jessen's theorem that, if $f(x)\in L$ on $(0, 1)$, and is of period 1, and if $f_k(x)=(1/n)\sum_{p=1}^{n-1}f(x+p/n)$, then $f_{2^k}(x)\to\int_0^1 f(t)dt$, $k\to\infty$, p.p. An example is given to show that this result is not always true if 2^k is replaced by k. Use is made of the classical theorem on the approximation to irrationals by rationals. (Received April 28, 1937.)

275. Mr. Philip Hall: *On primitive groups of linear substitutions.*

Let G be a primitive group of linear substitutions irreducible in the field of complex numbers, and let H be a normal Sylow-subgroup of G. According to Blichfeldt, the central of H is contained in that of G, and is therefore cyclic. *If H is not itself cyclic, it is of class 2, and its quotient-group is elementary abelian.* Thus H belongs to a well-known system of prime-power groups met with in other connections, for example, theta-characteristics, abelian collineation groups, Weyl-Brauer theory of spinors. There follows a theorem on solvable primitive linear groups analogous to the theorem of Galois on primitive solvable permutation groups: given the degree n, such a group is equivalent to a subgroup of a certain well-defined group Ω_n, in general insolvable. For $n=p^\alpha$, p prime, Ω_n may be described as the "linear holomorph" of an irreducible H, having central index $p^{2\alpha}$ and belonging to the system mentioned above. For m prime to N, $\Omega_{mn}=\Omega_m\times\Omega_n$. (Received April 26, 1937.)

276. Professor Dunham Jackson: *Orthogonal polynomials in two complex variables.*

Recent observations on the properties of orthogonal polynomials in two real variables (Duke Mathematical Journal, vol. 2 (1936), pp. 423–434; this Bulletin, abstract 42-9-335), taken in conjunction with the well-known work of Szegö, Walsh, and Carleman on orthogonal polynomials in a complex variable, point clearly to a corresponding theory for polynomials in two complex variables. This paper records the working out in detail of some of the more obvious features of the extension. The real orthogonal transformations which play a prominent part in the case of polynomials in two real variables are naturally replaced here by unitary transformations with complex coefficients. (Received April 26, 1937.)

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OFFICIAL COMMUNICATIONS

Meetings of the Society have been fixed at the following times and places:

STATE COLLEGE, PENNSYLVANIA, SUMMER MEETING AND COLLOQUIUM, September 7–10, 1937.

Abstracts must be in the hands of Associate Secretary T. R. Hollcroft, 531 West 116th St., New York, N. Y., not later than August 3. Abstracts received by the Secretaries not later than July 9 will appear in the July issue of the Bulletin. Professor John von Neumann will deliver a series of colloquium lectures on *Continuous geometry*. By invitation of the Program Committee, Professor Hassler Whitney will give an address entitled *Topological properties of differentiable manifolds*.

NEW YORK CITY, October 30, 1937.

Abstracts must be in the hands of Associate Secretary T. R. Hollcroft, 531 West 116th St., New York, N. Y., not later than October 2. Abstracts received by the Secretaries not later than September 3 will appear in the September issue of the Bulletin. By invitation of the Program Committee, Professor D. J. Struik will deliver an address entitled *The application of tensor analysis to problems of electrical engineering*.

IOWA CITY, IOWA, November 26–27, 1937.

Abstracts are due by October 30, 1937.

PASADENA, CALIFORNIA, November 27, 1937.

Abstracts are due by October 30, 1937.

R. G. D. RICHARDSON, *Secretary of the Society*.

Articles for insertion in the BULLETIN should be addressed to The Managing Editor, D. R. CURTISS, Northwestern University, Evanston, Ill. Reviews should be sent to W. R. LONGLEY, Yale University, New Haven, Conn. Notes should be sent to H. W. KUHN, Ohio State University, Columbus, Ohio.

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The initiation fees and the annual dues of members of the Society (see this BULLETIN, p. 322, May, 1930; and the List of Officers and Members, September, 1936, p. 67) are payable to the Treasurer of the Society, Professor P. A. Smith, Low Memorial Library, 531 West 116th St., New York, N. Y.

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